Homework assignment 8 is due Friday April 2

Exercise 1: How would you integrate a multivariate polynomial distribution over some region?

Exercise 2: Why did we not just assign $p(x \to y) = p(y)$ and $p(y \to x) = p(x)$ to achieve the balance condition in the Metro-Hasting Algorithm?

Exercise 3: Construct the edge probability for a three state Markov chain so that the stationary probability is $\left(\frac{1}{2}, \frac{1}{3}, \frac{1}{6}\right)$.

Exercise 4: Again consider the three state Markov chain with stationary probability is $\left(\frac{1}{2}, \frac{1}{3}, \frac{1}{6}\right)$. In the Metro-Hasting Algorithm one might select $q(y \to x) = \frac{1}{n}$ for all x and y. This would mean all edges are equally likely and one might select an edge by randomly generating an integer between 1 and n. What is the expected probability that the edge would be accepted?

Exercise 5: Try Gibbs sampling on $p(x) = \begin{pmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{pmatrix}$.

What happens? How does the Metropolis Hasting Algorithm do?

Exercise 6: Consider p(x) given by $x = (x_1, \cdots, x_{100})$ and $p(0) = \frac{1}{2}$, $p(x) = \frac{1}{2^{100}} \quad x \neq 0$. How does Gibbs sampling behave?